ENGAGING LEARNERS IN SYNCHRONOUS ONLINE TRAINING USING FACIAL EXPRESSION ANALYSIS TECHNOLOGY

Serap Zel

Under the Supervision of Dr. Elif Kongar

DISSERTATION

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN TECHNOLOGY MANAGEMENT

THE SCHOOL OF ENGINEERING

UNIVERSITY OF BRIDGEPORT

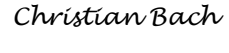
CONNECTICUT

November, 2020

ENGAGING LEARNERS IN SYNCHRONOUS ONLINE TRAINING USING FACIAL EXPRESSION ANALYSIS TECHNOLOGY

Approvals

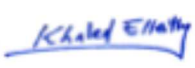
Committee Members

Name	Signature	Date
Dr. Elif Kongar		11/23/2020
Dr. Ruba Deeb		11/23/2020
Dr. Christian Bach		11/23/2020
Dr. Gazi Murat Duman		11/23/2020
Dr. Kurt A. Rosentrater		11/23/2020

Ph.D. in Technology Management Program Director

Dr. Elif Kongar		11/23/2020

Dean, School of Engineering

Dr. Khaled Elleithy		11/23/2020

ENGAGING LEARNERS IN SYNCHRONOUS ONLINE TRAINING USING FACIAL EXPRESSION ANALYSIS TECHNOLOGY

To my husband Ugur, our beautiful children Burak and Beren, my mom Sena and dad Kadir for their endless love and support…

1. Abstract

The rapid growth of digitalization and the rise in the number of remote work environments have amplified the importance of remote training using online learning platforms. The effectiveness of these online trainings heavily relies on various factors such as training content, methods and duration, trainer skills, and the technology platforms used in trainings. In addition to these internal, and generally, controllable factors, various uncontrollable factors also have a significant impact on the overall learning experience and outcomes. Consideration of cultural, generational, linguistic factors in addition to gender and race-related factors is essential in increasing the effectiveness of online training efforts. The purpose of this study is to investigate how facial recognition technology can aid in creating an engaging learning experience for diverse participants in online synchronous training. In particular, the study explores factors affecting the learning experience through an empirical analysis. Incorporating learners' feedback, practical design methods are delineated to form a highly inclusive and engaging learning model using facial expressions analysis.

ACKNOWLEDGEMENTS

I could not achieve this learning and complete the dissertation without help from many others. First of all, I want to share my deepest appreciation to Dr. Elif Kongar for her exceptional support, encouragement and mentorship throughout the PhD program as my committee chair and advisor. She is absolutely an inspirational role model for me with her passion, professionalism, and high ethics. I also would like to thank to my committee members, Dr. Christian Bach, Dr. Ruba Deeb and Dr. Kurt A. Rosentrater for their insightful and valuable comments. Dr. Gazi Murat Duman was instrumental in helping me with providing new perspectives and insights. I also thank you to University of Bridgeport for this fantastic Ph.D. program and for helping me to make a leap in my learning journey.

Finally, studying in the PhD program while working in a demanding full-time job with two little children would not have been possible without a supportive spouse. I am thankful to my husband Dr. Ugur Zel for his endless support, encouragement, and patience. Thanks to my children for their understanding and

Table of Contents

LIST OF TABLES

LIST OF FIGURES

2. Introduction

2.1. Research Problem and Scope

In line with the pace of technological advancements, the skills required to maintain compatibility in the marketplace is also rapidly changing. On the other hand, pandemics like COVID-19 limit in-person gatherings in traditional classroom settings. Online training solutions rise as a viable option when addressing these requirements with their versatile, agile, and cost-effective structures. Training participants can select areas where they want to develop themselves online and proceed with the online training at their own pace and place. However, it requires more self-discipline and better time management for learners to be on track on selected online learning and complete them on time. Online learning also requires higher self-motivation, drive and persistence from learners [1].

The global online learning market size was valued at 171 billion US dollars in 2019, and it is expected to grow to 375 billion US dollars by 2026 [2]. Corporations also lean more on online learning or blended learning options to develop their employees. The growing demand from learners and technological advancement drive the growth in the online learning market. In addition to providing access to larger audiences, reduced service costs compared to traditional classroom training settings justify the consideration of their investment. Despite all benefits of online learning, diversity and inclusion are two vital concerns to ensure the effectiveness of online training. Lack of involvement and engagement hinders learning ability, potentially leading to low retention rates in online courses [3-6]. Online trainings are signified by a 10 to 20 percent higher dropout rate compared to traditional classroom courses [7]. The primary reason for dropouts is identified as a lack of learner engagement and motivation with the training [8]. When the root

causes of lack of learner engagement and motivation are analyzed, different reasons are found out as it is shown in Fig. 1.

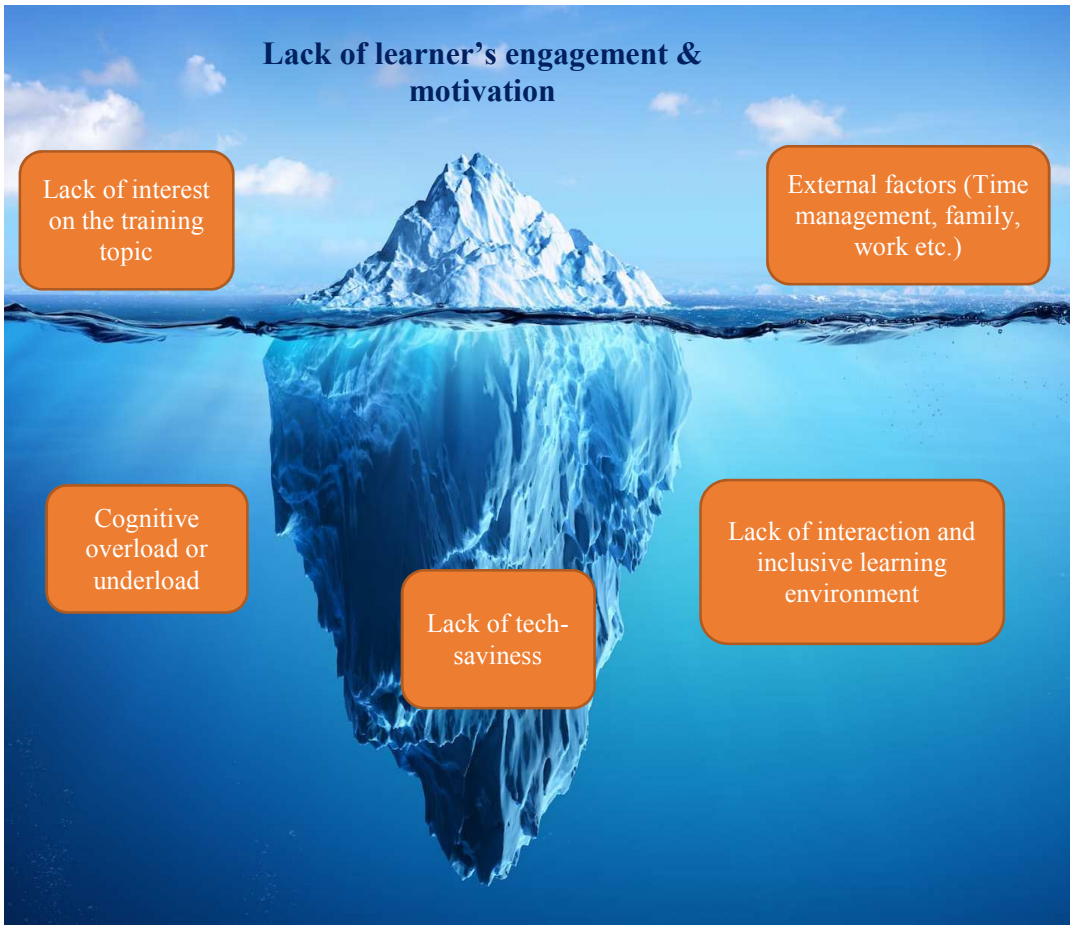


Fig. 1. Reasons for the Lack of Learner's Engagement and Motivation

In the literature, there are different definitions and dimensions of learning engagement. According to Fredricks et al. [9], there are three dimensions in learning engagement; cognitive, behavioral, and emotional. Cognitive engagement refers to learners' mental focus in the process of learning. Behavioral engagement is related to the learners' interaction with the trainer and other learners during the training. Emotional engagement focuses on the positive or negative reactions of learners to trainers and other learners. Emotional engagement can be tracked by analyzing the

facial expressions of learners during the training [10]. However, observing and understanding facial expressions and body languages of learners during the online training is not easy for trainers like in the traditional classroom setting.

On the other hand, online learning environments are open to learners from different cultural backgrounds. Sometimes trainers and instructors who do not have cross-cultural awareness and empathy may not be able to create an inclusive learning environment for learners with diverse backgrounds. Irrespective of this obstacle, there is no established norm that consistently measures and cultivates inclusivity and learning experience in online synchronous training. The general business practice has been and continues to be the utilization of training satisfaction surveys. Although these surveys are designed with high validity and reliability, there is always some level of bias since the results are solely based on subjective responses of learners. This data alone does not allow training providers and educational institutes to effectively improve the training content, design, technology, and quality of interaction further.

According to Bradford [11], the level of cognitive load affects learners' engagement and motivation in online courses. To avoid cognitive overload, the training design with the right visual and verbal elements is critical, as well as the delivery method of the training.

Aiming to retain learners via a more engaging and effective learning experience, this study investigates related influential factors through research questions listed below:

1. Which controllable and uncontrollable factors affect learners' experience? What is their impact?
2. Which elements in the online training trigger what kind of emotional responses in participants based on the facial expressions' analysis?

2.2. Motivation Behind Research

The magnitude of previous related work highlights the significance of factors that affect learning engagement and learners' experience. There are three popular methods to measure learning engagement: (1) Self-reports, which are questionnaires that learners report their engagement, attention, and general feedback (2) Observational check-lists, which are completed by an external observer and includes rating scales (3) Automated measurements, which use technological tools such as facial recognition tools, physiological and neurological sensor readings to get real-time engagement data [12]. Previous studies mostly focus on the training provider's perspective, with only a few focusing on the perspective of the learner via questionnaires. Focusing on results from self-reports is very helpful but might not be enough because results from surveys or self-reports might be biased.

Facial recognition technology can aid in shifting the focus on learners with its ability to detect and analyze participant emotions based on their physical features such as facial expressions, body movements, and other biological indicators during training [13]. Investigated under facial expressions analysis, this practice aids in more accurate measurement of participant attention, emotional reaction, and perceived difficulty levels of training sessions, creating a bridge between factual data and perceived experience input.

2.3. Potential Contributions of the Proposed Research

Facial recognition technology has been tested and utilized for measuring learners' emotions and overall learning experience in online learning [13-17]. The technology captures all physical movements such as body movements, voice, and some other biological signals. During online training, learners depict different expressions and mimic providing data regarding their

perceptions, attention, emotions, and processing. This data can then be utilized to adjust the content and/or teaching method and improve the overall learning experience.

Although there are many studies on the impact of cultural origin on facial expressions [18, 19], facial recognition technology has not been widely used to test culturally diverse groups of learners' attention, emotion, the overall experience in online synchronous training. This research aims to analyze learners' feedback via questionnaires and their emotional changes via facial recognition software in a hybrid manner and to contribute to the online learning research on how to create a more engaging and inclusive learning experience for learners.

3. Literature Review

This study uses the terms remote and online learning interchangeably. Similarly, these terms appear under a variety of additional terms, such as virtual learning, web-based learning, internet learning, e-learning, and distance learning in the literature review.

Online learning settings can be broadly categorized under synchronous and asynchronous learning. Synchronous learning occurs in real-time, allowing participants the ability to interact and ask questions concurrently. Some examples of synchronous learning tools are webinars, virtual live classrooms, video conferencing, and instant chat systems. Asynchronous learning is delivered through online channels and without real-time interaction. Asynchronous learners can manage their own learning speed and process freely [20, 21]. Examples of asynchronous learning examples include reading blogs and emails, watching or listening to pre-recorded video lessons or podcasts, participating in online discussion boards. Some online training combines these two and creates hybrid training models via synchronous and asynchronous tools. Based on the research of Offir, et al. [20], synchronous online learning is highly effective for students with high cognitive ability, and in general, learners prefer synchronous more than asynchronous learning methods. Testimony

to the arcane nature of the topic, Kunin, et al. [22], however, argue that learners preferred asynchronous format due to the effectiveness and clarity of presentations. The study also notes that the learners also indicate that synchronous format enables higher levels of additional interaction on both learner-trainer and learner-learner levels. Table 1 summarizes the differences between synchronous and asynchronous learning methods.

Table 1. Synchronous and Asynchronous Learning

Synchronous learning provides	**Asynchronous learning provides**
- Concurrent learner participation during training - Real-time communication and instant feedback - Higher levels of learner engagement and interaction	- Optional learner participation - Offline/delayed communication and instant feedback - Higher levels of convenience and flexibility

Related literature also offers research on learner equity and inclusion [23]. However, the majority of online courses are customarily designed and developed according to traditional Western culture traits. Globalizing the utilization of online training and its successful delivery requires, however, a well-designed approach that is sensitive to cultural nuances, different learning styles, and the psychological morals of non-Western learners. In this research, we focus on synchronous learning settings to understand how cultural factors such as cultural identity and native or preferred language of learners affect their learning experience in online training in addition to gender and age factors. In the literature review, all essential influential factors affecting online learning experience are examined carefully, and they are consolidated based on controllable and

uncontrollable factors. Controllable factors are factors mostly related to the trainer, training content, design, and delivery. Uncontrollable factors are factors mostly related to learners' demographics and characteristics. Table 2, while detailing the essential influential factors, also serves as a summary of related literature.

Table 2. Factors Affecting Online Learning Experience

Factors Affecting Online Learning Experience		Related Research
Controllable Factors		
Interaction	Trainer-Learner	[24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48]
	Learner-Learner / Peer Support	[29] [35] [36] [38] [40] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59]
	Learner-Content	[26] [34] [35] [40] [44] [46] [47] [48] [51] [53] [60] [61] [62] [63] [64] [65] [66]
Value-added feedback		[24] [26] [37] [52] [53] [54] [59] [64] [67] [68] [69] [70] [71] [72] [73]
Technological simplicity		[24] [32] [46] [61] [62] [74] [75] [76] [77] [78] [79]
Versatility to accommodate different learning and cognitive styles		[37] [39] [61] [64] [80] [81] [82] [83]
Trainer's expertise and competencies		[32] [45] [61] [84] [85] [86] [87] [88] [89] [90] [91]
Length, frequency, and duration of training		[92] [93] [94] [95] [96]
Uncontrollable Factors		
Learners' age		[3] [97] [98] [99] [100] [101] [102] [103]
Learners' gender		[3] [98] [99] [100] [101] [102] [104]
Learners' native or preferred language		[105] [106] [107] [108] [109] [110]

Learners' cultural identity		[37] [103] [104] [108] [111] [112] [113] [114] [115] [116] [117] [118] [119] [120] [121] [122]
Technology comfort level	For trainer	[40] [84] [123]
	For learner	[29] [31] [40] [62] [81] [123] [124] [125]
Learner's level of motivation to learn the particular topic		[3] [31] [40] [44] [61] [74] [126] [127] [128] [129]
External factors		[3] [31] [99] [127] [130] [131] [132]
Environmental factors		[97] [132] [133] [134]

3.1. Definitions of Factors Affecting Online Learning Experience

Interaction

The literature offers three different types of interaction in online learning that affect learning effectiveness; interaction with content, interaction with instructors, and interaction among peers [135].

Trainer-Learner Interaction

Trainer-learner interaction refers to the trainer's communication with learners and includes questions, answers, feedback, and guidance. The objective is to create active dynamic interaction with learners using technological tools and multimedia content to entice increased learner participation during online synchronous training.

Learner-Learner Interaction/Peer Support

Learner-learner interaction refers to learner-initiated communication and includes personal introductions, resource, idea, experience and opinion sharing, and collaboration on common projects. The objective is to create an inclusive community environment that supports and

cultivates ideas and opinion sharing verbally or in writing via tools such as chat boxes and discussion forums.

Learner-Content Interaction

Learner-content interaction refers to learners' learning process directly from the training content. This interaction takes place via text, audio, video, and simulation/game-based methods. The objective is to create an adaptive interface to address different learning styles while proactively responding to potential content-related questions and inquiries.

Value-added feedback

Value-added feedback refers to timely, constructive, and development-focused feedback that the trainer provides. Feedback from learners to the trainer is also useful for trainers to make changes in the content to address the gaps of learners. The objective is to provide learners with information regarding their progress, performance, and learning.

Technological Simplicity

Technological simplicity refers to the processing speed, installation time, ease of use, reliability, and user support of the technology used in online training. According to Van Merrienboer and Sweller [136], the automaticity in the use of the technology platform is critical to reducing the cognitive load of users. The objective is to create a user-friendly online training platform for learners, eliminate any possible technical problems, and provide proper user support to resolve technology-based problems.

Versatility to accommodate different learning and cognitive styles

Versatility refers to an adaptable and flexible training design that accommodates individual differences in perception, memory, thinking, and judgment among learners during online training. The objective is to create training content and materials with a different set of activities to address different learning styles so that learners can select activities based on their learning and cognitive styles.

Trainer's expertise and competencies

Trainer's expertise and competencies refer to a specific set of competencies such as content designer, facilitation, advisor, researcher, technologist, evaluator, and administrator. The objective is to transfer knowledge and information in a way that all learners can understand fully, creating a collaborative and inclusive learning environment for every learner.

Length, frequency, and duration of the training

This factor refers to the length, frequency, and duration of the training that is specifically designed based on the training content, the number of training participants, technology, learning objectives, and methodology that are used. The objective is to achieve planned learning outcomes while keeping learners' engagement and attention high during the learning process.

Learner's age, gender, and cultural identity

This factor refers to learners' demographic characteristics such as age, gender, and cultural/ethnic identity which have a direct and indirect impact on learners' learning styles and experience.

Technology comfort level (For trainer and learner)

Technology comfort level refers to the comfort and confidence levels of trainers and learners during the utilization of the selected learning technology. Some degree of technology comfort level

is required for the trainer and learner as a technology platform has to be used in an online learning setting. According to Chien [137], computer experience, gender, age, personality traits, social-economic background, and cultural background are factors influencing technology comfort level.

Learner's level of motivation on the training topic

This factor refers to the self-interest and self-motivation of learners on the training topic. Several studies also found that the flexibility and convenience of the training affect learner's level of motivation for online training [138]. If learners' self-motivation is high, learners participate and engage more in online training.

External factors

External factors refer to financial, unemployment, family, and work-related responsibilities that affect learners' learning experience and motivation in online learning. Time conflict is one of the most common external problems that learners face.

Environmental factors

Environmental factors refer to noise, light, and interruptions by other factors such as a phone ring sound or someone else in the same environment where the learner connects to online training.

After controllable and uncontrollable factors are identified, their relationships in creating engaging and effective learning experiences are mapped as it is shown in Fig 2. During the literature review, it is identified that all the below factors affect the online learning experience of learners. However, some of these factors affect each other, as well.

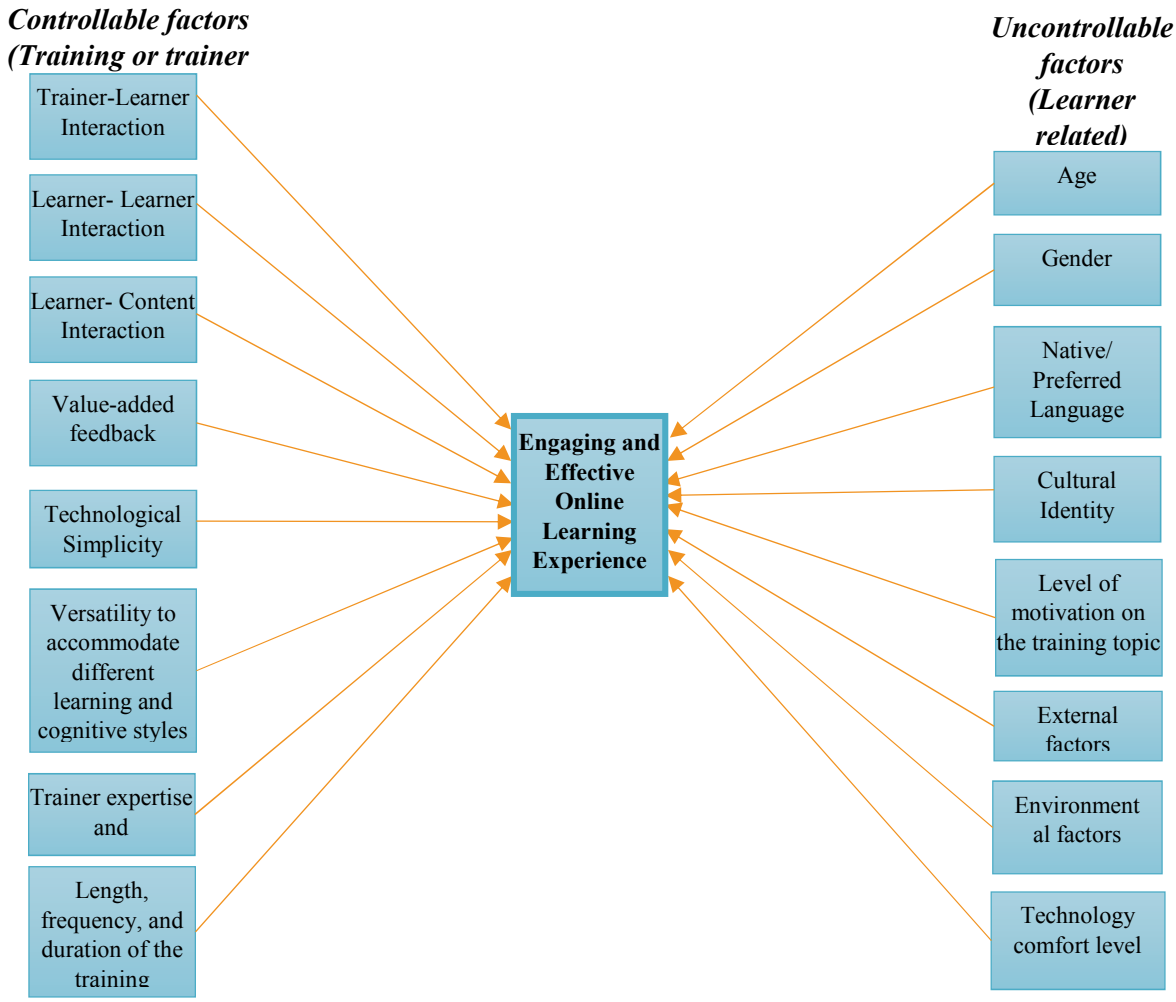


Fig. 2. The framework for the relationship between controllable and uncontrollable factors and learning experience

3.2. Interconnection Between Factors Affecting Online Learning Experience

All factors are labeled as it is shown in Table 3 and their relationships between factors are identified and mapped in Table 4 as below.

Table 3. The List of Controllable and Uncontrollable Factors with Labels

Category	Factor	Label
Controllable	Trainer-learner Interaction	A
	Learner-Learner Interaction / Peer Support	B
	Learner-Content Interaction	C

	Value-added feedback between the trainer and learner	D
	Technological simplicity	E
	Versatility to accommodate different learning and cognitive styles	F
	Trainer's expertise and competencies	G
	Length, frequency, and duration of training	H
Uncontrollable	Learners' age	1
	Learners' gender	2
	Learners' native or preferred language	3
	Learner's cultural identity	4
	Learner's technology comfort level	5
	Learner's level of motivation to learn the particular topic	6
	External factors	7
	Environmental factors	8

Table 4. Interconnections Between Controllable and Uncontrollable Factors

	A	B	C	D	E	F	G	H	1	2	3	4	5	6	7	8
A		Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
B	Y		Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
C	Y	Y		Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y
D	Y	Y	Y		N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
E	N	N	N	Y		Y	N	N	N	N	N	N	Y	N	N	N
F	Y	N	N	Y	Y		Y	Y	N	N	Y	N	N	N	N	N
G	Y	N	N	Y	N	N		N	N	N	N	N	N	N	N	N
H	N	N	N	Y	Y	Y	Y		N	N	N	N	N	N	N	N
1	N	N	N	N	N	N	N	N		N	N	N	Y	N	N	N
2	N	N	N	N	N	N	N	N	N		N	N	Y	N	N	N
3	Y	N	Y	N	Y	N	N	N	N	N		Y	Y	N	N	N
4	N	N	N	N	N	N	N	N	N	N	Y		N	N	N	N
5	Y	N	Y	Y	Y	Y	Y	N	N	N	N	N		N	N	Y
6	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y		Y	Y
7	N	Y	N	N	N	N	N	Y	Y	N	N	N	Y	Y		N
8	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	Y	

Y: Yes, there is a connection between two factors N: No, there is no connection between two factors

There are many interconnections between different factors as it is shown in Table 4. Here are some examples of interconnections between factors:

Trainer-Learner interaction

Trainer-Learner interaction affects other interactions, such as learner-learner interaction and learner-content interaction [26]. When the trainer asks questions to learners and shares his/her view on learners' answers, learners have increased interaction among themselves, and they also have a higher engagement and attention on the training content.

Value-added feedback

Value-added feedback from the trainer to learners reinforces the motivation level of learners [139].

Learner's age

Age affects the self-motivation level of learners; older learners tend to be more motivated to learn as they are more self-aware of their learning needs and interests [138].

Technology comfort level

The higher technology comfort level has a positive impact on the motivation level of learners.

4. Research Plan

4.1. Research Plan/Method

The research plan includes an empirical analysis to get feedback from participants through an online training program and use facial expressions analysis of participants during the training. It is based on a quantitative method that relies on the training participants' answers from pre-training and post-training questionnaires and conducting facial expressions analysis of participants through a facial expressions' analysis software. All executed steps in the research plan are shown in Fig.3.

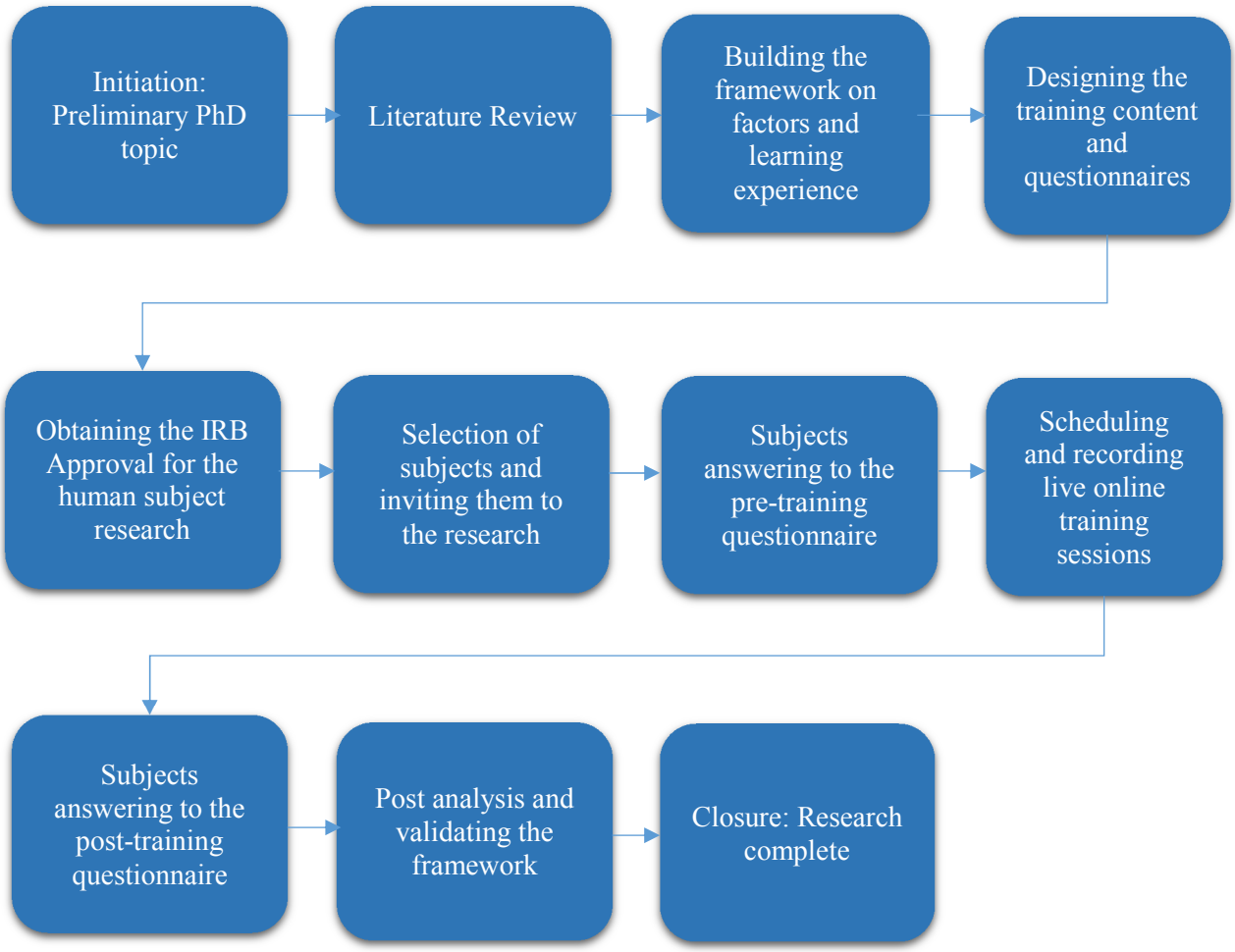


Fig.3. The Research Plan Steps

4.2. Questionnaires

In both pre-training and post-training questionnaires, relationships between factors affecting online learning experience, as shown in Table 4, are asked to training participants. They are asked to rate the significance level of the relationship between two factors in each question ("Very insignificant"=0 to "Very significant"=5). The purpose of questionnaires is to validate the research framework, as it is shown in Fig.1. and conclude the weights of each influential controllable and uncontrollable factor using ANP (Analytic Network Process). In addition to relationship level questions, in the pre-training questionnaire, there were questions regarding participants'

demographics (age, gender, region, cultural origin, education, employment status). In the post-training questionnaire, they are also asked questions about their learning experience during online training. Both questionnaires were anonymous and had 16 questions in each.

5. Implementation Plan

5.1. Subject Participation and Selection Process

128 participants from different age groups, gender, cultural origins, and regions are invited to the empirical analysis. These participants are selected based on their demographics (minimum age 21) on social media channels. Each participant is provided information regarding the research and asked for their written consent to participate in the research. Out of the 128 participants, 113 volunteer participants (participation rate: 88%) gave consent to participate in the empirical analysis. This research experiment has been approved by the University of Bridgeport Institutional Review Board (UB IRB). Table 5 provides summary information on the participants' demographics.

Table 5. Demographics of participants

		N	P
Gender	Female	63	55.8%
	Male	50	44.2%
Age	21-30	19	16.8%
	31-40	35	31.0%
	41-50	40	35.4%
	51-60	11	9.7%
	61+	8	7.1%
Education level	High school	5	4.4%
	Bachelor	37	32.7%
	Master/MBA	58	51.3%
	PhD	13	11.5%
Cultural origin	White	38	33.6%
	European	22	19.5%
	Asian	20	17.7%

	Middle Easterner	12	10.6%
	Hispanic/Latino	8	7.1%
	Mixed	8	7.1%
	African American	5	4.4%
Region	North America	44	38.9%
	Europe	37	32.7%
	Middle East	17	15.0%
	Asia	10	8.8%
	Latin America	3	2.7%
	Africa	2	1.8%
Native/Preferred language	English	54	47.8%
	Middle Eastern	43	38.1%
	European	10	8.8%
	Spanish	3	2.7%
	Asian	3	2.7%
Employment status	Working (full or part time)	76	67.3%
	Self-employed	12	10.6%
	Student	12	10.6%
	Not working	10	8.8%
	Retired	3	2.7%

N: Number of participants in the study P: Percentage of participants in the study

5.2. Technology Setup and Data Collection

Participants are asked to take part in online training and answer online pre-training and post-training questionnaires. The training topic is selected to be a non-technical topic to cover the general interests of all participants. Training is designed to be live, synchronous training on *"The Impact of Technology on Emotional Intelligence"* topic for 30 minutes in English, using the Zoom video conference platform. The trainer is a subject matter expert on this topic with more than 20 years of experience in the field. He is highly experienced in teaching in both classroom and online settings. The trainer and all participants were requested to keep their web cameras on during the live online training to allow facial expressions analysis. Maximum 6 participants are invited to each training session to allow accurate facial expressions analysis. A total of 28 live training sessions is scheduled and recorded for further analysis.

Recorded training sessions are analyzed using Affectiva iMotions Facial Expressions Analysis Software [140] to identify participants' facial expressions and emotions during the training.

5.3. Data Analysis

Two different data sets are analyzed and consolidated to draw findings and suggestions for the better learning experience of diverse participants, as it is shown in Table 6.

Table 6. Data Source Summary

Data source	Objective
A. Pre and post-training questionnaires	1. To analyze impact ratings between each controllable and uncontrollable factor based on participants' demographics using ANP (Analytic Network Process) methodology
	2. To measure the overall learning experience of participants and get their feedback on most and least liked elements in training and analyze them based on demographics
B. Facial expressions recording in each training session	1. To analyze the overall engagement of participants based on their facial expressions
	2. To analyze the impact of specific factors/events in training on participants' emotions

6. Preliminary Results

6.1. Analysis from Questionnaires

Based on the results of questionnaires, participants rated their overall learning experience as 8.43 out of 10 in this online training. The technology platform (Zoom) was perceived as an easy to use

and simple platform by most of the participants. Their interest level in the training topic was rated high as 8.05 out of 10. Detailed results are shown in Table 7.

Table 7. Descriptive Statistics on Questionnaires' Results

Results	(Scale: 1: Lowest to 10: Highest)			
	Interest level to the training topic	Overall learning experience	The simplicity of the technology platform	The technology comfort level
Mean	8.05	8.43	9.01	8.70
Standard Error	0.15	0.15	0.13	0.17
Median	8	9	9	9
Mode	8	8	10	10
Standard Deviation	1.63	1.48	1.28	1.66
Sample Variance	2.65	2.20	1.63	2.77
Range	8	8	5	7
Min.	2	2	5	3
Max.	10	10	10	10
Sum	902	784	856	818
Count	112	93	95	94

When we looked at the results of demographics-based breakdowns, 31-40 male age group reported the lowest interest level to the training topic (6.91). Male groups with a high school degree had the lowest average learning experience (5.0), while female groups with a high school degree had the highest average learning experience (9.0) among all education level-based results.

Middle Easterner female groups had the lowest average learning experience (6.8), while Hispanic/Latino female groups had the highest average learning experience (10.0) among all cultural groups. 40% of comments from the Middle Easterner group revolved around the limited

duration of the training and limited time for discussion. Training content in terms of clarity and simplicity were consistently rated highest in terms of the most liked element in training across all cultural groups.

The retired group had the lowest average learning experience (7.0) among other participants in different employment statuses, followed by the not-working group (7.67) compared to other employment statuses.

African American male group rated highest in terms of comfort level with having their camera on (10.0) during the training, followed by African American female group (9.8), while White male group rated lowest (7.5).

6.2. ANP Analysis

To obtain the impact level of each criterion in this analysis, a pairwise comparison matrix is formed and Analytic Network Process (ANP) is applied. ANP, first proposed by Saaty [141] is a more general form of the analytic hierarchy process (AHP) used in multi-criteria decision analysis. AHP model is based on a decision-making framework that assumes unidirectional hierarchical relationships among decision levels, whereas ANP allows for a more complex relationship among the decision levels and attributes as it does not require a strict hierarchical structure [142]. ANP does not require independence among factors while ANP requires. Therefore, in this research ANP is more suitable to use as there is some interdependence between factors affecting online learning experience. In ANP, a supermatrix, known as partition matrix, is formed by setting the local priority vectors on suitable columns. A weighted supermatrix is obtained via normalizing each column in the supermatrix. The weighted super-matrix W needs to be limited by raising it to a sufficiently large power s until it converges and becomes a long-term stable super-matrix $\lim_{s\to\infty}(W)^s$[143].

In this research, the linguistic scale provided in Table 8 is applied to form the supermatrix.

Table 8. The linguistic scale for the assessments

Linguistic terms	Degree of impact
Very significant	5
Significant	4
Neutral	3
Insignificant	2
Very insignificant	1

The values in the supermatrix are obtained by taking the average of assessments of the survey participants. The weights of the criteria by limiting the power of the weighted super-matrix until it converges and reaches a steady state. The weights, along with the rankings of the criteria, are provided in Table 9.

Table 9. The Weights and the Rankings of the Criteria

Criteria		Weight	Rank
Controllable	Trainer-Learner Interaction	0.1264	1
	Learner-Learner Interaction / Peer Support	0.1131	4
	Learner-Content Interaction	0.1213	2
	Value-added feedback between the trainer and learner	0.1184	3
	Technological simplicity	0.0331	12
	Versatility to accommodate different learning and cognitive styles	0.0589	7
	Trainer’s expertise and competencies	0.0313	13
	Length, frequency, and duration of training	0.0281	14
Uncontrollable	Learners’ age	0.0148	16
	Learners’ gender	0.0254	15
	Learners’ native or preferred language	0.0460	8
	Learner’s cultural identity	0.0386	10
	Learner's technology comfort level	0.0655	6

	Learner's level of motivation to learn the particular topic	0.1003	5
	External factors	0.0432	9
	Environmental factors	0.0357	11

Based on the ANP results, the interaction is found out as the most impactful factor among all others. The top 3 highly impactful factors are identified as below;

1- Trainer-Learner interaction

2- Learner-Content interaction

3- Value-added feedback between the trainer and learner

To check the internal consistency in the data set which is taken from questionnaires, Cronbach's alpha is applied in this research. The alpha was developed by Lee Cronbach [144] in 1951 to measure the internal consistency which is identified as a number between 0 and 1. Assessors and researchers need to calculate the alpha to add validity and accuracy to the interpretation of their data [145]. If the items in the data sets are highly correlated to each other, the value of alpha is increased. In this research, Cronbach's alpha score is calculated as 0.95.

Table 10. Cronbach's alpha results

Metric	Result
Number of questions	62
Sum of the item variances	48.00
The variance of total scores	748.04
Cronbach's alpha	**0.95**

6.3. Facial Expressions Analysis

After recording all training sessions, facial expressions of training participants are analyzed on Affectiva iMotions Facial Expressions Analysis Software, as it is shown in Fig.4.

Fig. 4. The Facial Analysis Screenshot on Affectiva iMotions Software

In the software, there are seven emotions that are identified, as mentioned in Fig.5. These seven emotions and facial expressions are analyzed for each participant from the recorded training sessions using the Affectiva iMotions software.

Fig.5. The Classification of Seven Emotions in Affectiva iMotions Facial Expressions Analysis Software [146]

In addition to emotions, engagement, valence, and attention of participants during the training can also be measured. Their definitions are explained below based on Affectiva's metrics [146].

a) Engagement: A measure of facial muscle activation that illustrates the subject's expressiveness

b) Valence: A measure of the positive or negative nature of the recorded person's experience: positive, negative, neutral

c) Attention: A facial expression that is determined by changes in facial landmarks.

To analyze the impact of some specific events on participants' emotions and attention during the live online training, the training was designed with some specific design elements, as it is shown in Table 11. Five annotations (events) are mapped in the facial analysis tool to see the changes in facial expressions of participants. They can also be seen in the left column on the screenshot from the software in Fig.4.

Table 11. Annotations in the Facial Expressions Analysis

No	Identified Annotations
1	The trainer asks a question to participants and participant(s) answers
2	The trainer reads a slide that includes only text
3	The trainer explains a slide that includes only visual images
4	Participants watch a short video
5	The trainer's phone is ringing loudly and shortly during the training (only one time)

These annotations are mapped in each recorded training session for each recorded session and participants' emotional responses at these events are analyzed for 42 participants. The results of emotional and facial expressions are summarized in Table 12.

Table 12. The Breakdown of Participants' Emotions and Facial Metrics in the Training

Metrics		Events from the training				
		Trainer's Questions	Slides with text only	Slides with visuals only	Watching the video	Phone ring
Emotions	Anger	1.04	0.92	1.78	1.15	4.16
	Contempt	1.42	2.68	0.87	1.74	3.21
	Disgust	1.33	0.82	0.65	2.14	2.58
	Fear	0.41	2.22	0.93	0.33	0.31
	Joy	16.41	0.60	1.66	29.48	3.40
	Sadness	1.28	0.51	1.10	1.52	0.77
	Surprise	2.95	1.31	3.11	1.38	0.52
Facial Metrics	Engagement	30.73	15.98	13.91	44.23	23.26
	Valence	8.47	-3.86	-4.35	24.14	-8.25
	Attention	82.59	87.64	94.56	84.23	67.82

Data unit: The average of probabilities in each emotion and facial metric

Based on facial and emotional results, showing an interesting video to participants during online training created the highest engagement in participants during live online training. In our experiment group, a video about the "Marshmallow test" was shown to participants during the training [147]. This video was short (3 min.) and includes the experiment that was done on toddler

kids. The second-highest engagement comes from the interaction between the trainer and participants through questions. In this experiment, a total of 141 individual reactions to the trainer's questions was analyzed one by one. Each question that the trainer asked during the training triggered some facial expressions in participants in the Trainer's Questions column in Table 11. The most notable emotion that was triggered by the trainer's questions was "joy" emotion.

On the other hand, when the trainer read a slide with text only, "joy" was the lowest emotion. The text slide triggered "contempt" and "fear" emotions. So, this means that participants did not enjoy these slides.

Slides with visuals only triggered more "surprise" emotions while the video triggered "joy" emotion. Using visual images (video and pictures) in the training content help to create more attention compared to text-based content. It is also not surprising to see a background noise like a loud phone ring sound during the training triggers negative emotions such as anger, contempt, and disgust, although the attention is very high during the phone ring sound.

Gender-based breakdown (22 female and 20 male) in results is shown in Table 13. and Table 13. "Joy" emotion is triggered more in female participants in case of trainer's questions (86% higher than the male group) and watching the video (91% higher than the male group). The engagement of both female and male groups was highest when they were watching the video, compared to all other events in training. In almost all events, the attention of the female group was higher than the male group.

Table 13. The Breakdown of Female Participants' Emotions and Facial Metrics in the Training

Metrics	Events from the training

		Trainer's Questions	Slides with text only	Slides with visuals only	Watching the video	Phone ring
Emotions	Anger	0.64	0.52	0.71	0.21	0.29
	Contempt	1.50	3.41	0.99	1.37	5.64
	Disgust	1.16	0.49	0.48	0.38	0.43
	Fear	0.36	3.62	1.70	0.31	0.57
	Joy	20.03	0.93	2.53	37.71	1.54
	Sadness	0.70	0.46	0.88	0.10	0.32
	Surprise	2.04	1.85	1.51	1.84	0.60
Facial Metrics	Engagement	33.74	11.71	11.95	47.30	17.78
	Valence	13.06	-3.33	-0.88	35.39	-12.82
	Attention	82.33	94.94	94.55	86.55	76.07

Data unit: The average of probabilities in each emotion and facial metric

Male participants had a more negative reaction to the loud phone ring background noise than the female participants. The phone ring triggered more "anger" emotion in the male group, while it triggered more "contempt" emotion in the female group. In both groups, participants' attention dropped significantly during the loud phone ring background noise.

Table 14. The Breakdown of Male Participants' Emotions and Facial Metrics in the Training

Metrics	Events from the training

		Trainer's Questions	Slides with text only	Slides with visuals only	Watching the video	Phone ring
Emotions	Anger	1.53	1.55	3.03	2.48	8.81
	Contempt	1.34	1.54	0.72	2.27	0.30
	Disgust	1.53	1.33	0.83	4.61	5.16
	Fear	0.52	0.01	0.02	0.35	0.01
	Joy	10.79	0.09	0.65	17.96	5.62
	Sadness	2.27	0.60	1.36	3.51	1.31
	Surprise	4.32	0.45	4.98	0.74	0.44
Facial Metrics	Engagement	26.15	22.69	16.21	39.93	29.84
	Valence	1.53	-4.68	-8.41	8.40	-2.76
	Attention	81.15	77.91	94.58	80.58	57.91

Data unit: The average of probabilities in each emotion and facial metric

7. Managerial/Practical Implications

Based on the results of this study, some important findings for corporations that invest in customized online learning platforms and academic/educational institutions that design online programs are summarized in Table 15.

Table 15. The Summary of Managerial/Practical Implications

Category	Findings

Training type	If the training topic requires and triggers more discussion among participants, participants tend to prefer synchronous training types.
Training design	The top 3 factors affecting learners' engagement and experience directly are as following: 1-Trainer-Learner Interaction (Trainers should ask questions and provide value-added feedback to participants) 2-Learner-Content Interaction (Interesting and relevant video and visuals) 3-Learner-Learner Interaction (Trainers should trigger this interaction with questions)
Learner's demographics	Learners' age & gender differences seem not to have a significant impact on their learning experience. Age or gender-specific training design might not be feasible for corporations and institutions in creating successful online training programs.
External factors	Any negative external factors such as background noises and technical challenges in online training should be eliminated as much as possible for a better learner experience.

8. Conclusions

Based on the empirical analysis through ANP and facial expressions analysis, it is clear that the interaction is the most important factor affecting learner's engagement and attention in live online training. Facial expressions analysis validated ANP results that trainer's questions (trainer-learner interaction), and a short interesting video in the training (learner-content interaction) creates higher engagement among training participants. To create a better learning experience for participants, it is important to design an interactive online training by asking relevant questions to training participants and adding visual tools like interesting and relevant videos. Environmental factors such as background noise disturb participants, decrease their attention significantly and trigger negative emotions.

9. Limitations and Future Work

The online remote empirical analysis created challenges to get facial expressions analysis of some participants in this study. The facial analysis software was not able to capture facial expressions from participants who did not stay close to their camera or did not have enough light in their room during the training (uncontrollable factors).

In the future, the research would benefit from having a larger group of participants in a more controllable setting. Additionally, it would benefit from the inclusion of further participants from Asia and Africa to be able to obtain further data on cross-cultural differences in the online learning experience.

Bibliography

[1] M. Martinez, "High attrition rates in e-learning: Challenges, predictors, and solutions," *The eLearning Developers Journal,* vol. 2, no. 2, pp. 1-7, 2003.

[2] P. W. S. Gankar, "E-Learning Market Size By Technology," GMI215, May 2020 2019, Available: https://www.gminsights.com/industry-analysis/elearning-market-size.

[3] J.-H. Park and H. J. Choi, "Factors influencing adult learners' decision to drop out or persist in online learning," *Journal of Educational Technology & Society,* vol. 12, no. 4, pp. 207-217, 2009.

[4] P. Bawa, "Retention in online courses: Exploring issues and solutions—A literature review," *Sage Open,* vol. 6, no. 1, p. 2158244015621777, 2016.

[5] E. Heyman, "Overcoming student retention issues in higher education online programs," *Online Journal of Distance Learning Administration,* vol. 13, no. 4, 2010.

[6] Y. Lee and J. Choi, "A review of online course dropout research: Implications for practice and future research," *Educational Technology Research and Development,* vol. 59, no. 5, pp. 593-618, 2011.

[7] M. Herbert, "Staying the course: A study in online student satisfaction and retention," *Online Journal of Distance Learning Administration,* vol. 9, no. 4, pp. 300-317, 2006.

[8] Y. Levy, "Comparing dropouts and persistence in e-learning courses," *Computers & education,* vol. 48, no. 2, pp. 185-204, 2007.

[9] J. Fredricks, W. McColskey, J. Meli, J. Mordica, B. Montrosse, and K. Mooney, "Measuring Student Engagement in Upper Elementary through High School: A Description of 21 Instruments. Issues & Answers. REL 2011-No. 098," *Regional Educational Laboratory Southeast,* 2011.

[10] Z. Zhang, Z. Li, H. Liu, T. Cao, and S. Liu, "Data-driven Online Learning Engagement Detection via Facial Expression and Mouse Behavior Recognition Technology," *Journal of Educational Computing Research,* vol. 58, no. 1, pp. 63-86, 2020.

[11] G. R. Bradford, "A relationship study of student satisfaction with learning online and cognitive load: Initial results," *The Internet and Higher Education,* vol. 14, no. 4, pp. 217-226, 2011.

[12] J. Whitehill, Z. Serpell, Y.-C. Lin, A. Foster, and J. R. Movellan, "The faces of engagement: Automatic recognition of student engagementfrom facial expressions," *IEEE Transactions on Affective Computing,* vol. 5, no. 1, pp. 86-98, 2014.

[13] D. Yang, A. Alsadoon, P. Prasad, A. Singh, and A. Elchouemi, "An emotion recognition model based on facial recognition in virtual learning environment," *Procedia Computer Science,* vol. 125, pp. 2-10, 2018.

[14] H.-R. Chen, "Assessment of learners' attention to e-learning by monitoring facial expressions for computer network courses," *Journal of Educational Computing Research,* vol. 47, no. 4, pp. 371-385, 2012.

[15] T. Van Gog, H. Jarodzka, K. Scheiter, P. Gerjets, and F. Paas, "Attention guidance during example study via the model's eye movements," *Computers in Human Behavior,* vol. 25, no. 3, pp. 785-791, 2009.

[16] Y. Liu, L. Wang, and W. Li, "Emotion analysis based on facial expression recognition in virtual learning environment," *International Journal of Computer and Communication Engineering,* vol. 6, no. 1, p. 49, 2017.

[17] J. Valera, J. Valera, and Y. Gelogo, "A review on facial recognition for online learning authentication," in *2015 8th International Conference on Bio-Science and Bio-Technology (BSBT)*, 2015, pp. 16-19: IEEE.
[18] R. E. Jack, R. Caldara, and P. G. Schyns, "Internal representations reveal cultural diversity in expectations of facial expressions of emotion," *Journal of Experimental Psychology: General,* vol. 141, no. 1, p. 19, 2012.
[19] M. Gendron, C. Crivelli, and L. F. Barrett, "Universality reconsidered: Diversity in making meaning of facial expressions," *Current Directions in Psychological Science,* vol. 27, no. 4, pp. 211-219, 2018.
[20] B. Offir, Y. Lev, and R. Bezalel, "Surface and deep learning processes in distance education: Synchronous versus asynchronous systems," *Computers & Education,* vol. 51, no. 3, pp. 1172-1183, 2008.
[21] B. G. Smith, "E-learning technologies: A comparative study of adult learners enrolled on blended and online campuses engaging in a virtual classroom," Capella University, 2010.
[22] M. Kunin, K. N. Julliard, and T. E. Rodriguez, "Comparing face-to-face, synchronous, and asynchronous learning: postgraduate dental resident preferences," *Journal of dental education,* vol. 78, no. 6, pp. 856-866, 2014.
[23] D. R. Smith and D. F. Ayers, "Culturally responsive pedagogy and online learning: Implications for the globalized community college," *Community College Journal of Research and Practice,* vol. 30, no. 5-6, pp. 401-415, 2006.
[24] R. Wood and S. Shirazi, "A systematic review of audience response systems for teaching and learning in higher education: the student experience," *Computers & Education,* p. 103896, 2020.
[25] D. Zhang, L. Zhou, R. O. Briggs, and J. F. Nunamaker Jr, "Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness," *Information & management,* vol. 43, no. 1, pp. 15-27, 2006.
[26] K. Swan, "Learning effectiveness online: What the research tells us," *Elements of quality online education, practice and direction,* vol. 4, no. 1, pp. 13-47, 2003.
[27] J. Richardson and K. Swan, "Examing social presence in online courses in relation to students' perceived learning and satisfaction," 2003.
[28] R. M. Palloff, K. Pratt, and D. Stockley, "Building learning communities in cyberspace: effective strategies for the online classroom," *The Canadian Journal of Higher Education,* vol. 31, no. 3, p. 175, 2001.
[29] J. W. Sit, J. W. Chung, M. C. Chow, and T. K. Wong, "Experiences of online learning: students' perspective," *Nurse education today,* vol. 25, no. 2, pp. 140-147, 2005.
[30] E. Webb*, A. Jones, P. Barker, and P. Van Schaik, "Using e-learning dialogues in higher education," *Innovations in Education and Teaching International,* vol. 41, no. 1, pp. 93-103, 2004.
[31] Y. Lee, J. Choi, and T. Kim, "Discriminating factors between completers of and dropouts from online learning courses," *British Journal of Educational Technology,* vol. 44, no. 2, pp. 328-337, 2013.
[32] K.-J. Kim and C. J. Bonk, "The future of online teaching and learning in higher education," *Educause quarterly,* vol. 29, no. 4, pp. 22-30, 2006.
[33] T. Anderson, "Towards a theory of online learning," *Theory and practice of online learning,* vol. 2, pp. 109-119, 2004.

[34] Y.-C. Kuo, A. E. Walker, K. E. Schroder, and B. R. Belland, "Interaction, Internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses," *The internet and higher education,* vol. 20, pp. 35-50, 2014.
[35] K. L. Murphy and L. Cifuentes, "Using Web tools, collaborating, and learning online," *Distance Education,* vol. 22, no. 2, pp. 285-305, 2001.
[36] A. Hirumi, "The design and sequencing of elearning interactions: a grounded approach," *International Journal on E-learning,* vol. 1, no. 1, pp. 19-27, 2002.
[37] C. McLoughlin and R. Oliver, "Designing learning environments for cultural inclusivity: A case study of indigenous online learning at tertiary level," *Australasian Journal of Educational Technology,* vol. 16, no. 1, 2000.
[38] E. Sung and R. E. Mayer, "Five facets of social presence in online distance education," *Computers in Human Behavior,* vol. 28, no. 5, pp. 1738-1747, 2012.
[39] N. Michinov, S. Brunot, O. Le Bohec, J. Juhel, and M. Delaval, "Procrastination, participation, and performance in online learning environments," *Computers & Education,* vol. 56, no. 1, pp. 243-252, 2011.
[40] R. A. Croxton, "The role of interactivity in student satisfaction and persistence in online learning," *Journal of Online Learning and Teaching,* vol. 10, no. 2, p. 314, 2014.
[41] Y. J. Joo, K. Y. Lim, and S. Y. Park, "Investigating the structural relationships among organisational support, learning flow, learners' satisfaction and learning transfer in corporate e□learning," *British Journal of Educational Technology,* vol. 42, no. 6, pp. 973-984, 2011.
[42] D. R. Garrison, M. Cleveland-Innes, and T. S. Fung, "Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework," *The internet and higher education,* vol. 13, no. 1-2, pp. 31-36, 2010.
[43] P. Shea and T. Bidjerano, "Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education," *Computers & Education,* vol. 52, no. 3, pp. 543-553, 2009.
[44] H. Lim, S.-G. Lee, and K. Nam, "Validating E-learning factors affecting training effectiveness," *International Journal of Information Management,* vol. 27, no. 1, pp. 22-35, 2007.
[45] J. Finkelstein, *Learning in real time: Synchronous teaching and learning online*. Jossey-Bass, 2006.
[46] M. Clark-Ibanez and L. Scott, "Learning to teach online," *Teaching Sociology,* vol. 36, no. 1, pp. 34-41, 2008.
[47] B. Best and S. C. Conceição, "Transactional distance dialogic interactions and student satisfaction in a multi-institutional blended learning environment," *European Journal of Open, Distance and E-learning,* vol. 20, no. 1, pp. 139-153, 2017.
[48] P. C. Abrami, R. M. Bernard, E. M. Bures, E. Borokhovski, and R. M. Tamim, "Interaction in distance education and online learning: Using evidence and theory to improve practice," *Journal of Computing in Higher Education,* vol. 23, no. 2-3, pp. 82-103, 2011.
[49] J. Gilbert, S. Morton, and J. Rowley, "e□Learning: The student experience," *British Journal of Educational Technology,* vol. 38, no. 4, pp. 560-573, 2007.
[50] S. Y. Liu, J. Gomez, and C.-J. Yen, "Community college online course retention and final grade: Predictability of social presence," *Journal of Interactive Online Learning,* vol. 8, no. 2, 2009.

[51] T. Anderson, "Teaching in an online learning context," *Theory and practice of online learning,* vol. 273, 2004.
[52] T. Guasch, A. Espasa, I. M. Alvarez, and P. A. Kirschner, "Effects of feedback on collaborative writing in an online learning environment," *Distance education,* vol. 34, no. 3, pp. 324-338, 2013.
[53] P. T. Northrup, "Online learners' preferences for interaction," *The perfect online course: Best practices for designing and teaching,* pp. 463-473, 2009.
[54] M. H. Jones and A.-M. Gallen, "Peer observation, feedback and reflection for development of practice in synchronous online teaching," *Innovations in Education and Teaching International,* vol. 53, no. 6, pp. 616-626, 2016.
[55] J. H. Sharp and J. B. Huett, "Importance of learner-learner interaction in distance education," *Director,* p. 07, 2006.
[56] B. Oyarzun, J. Stefaniak, L. Bol, and G. R. Morrison, "Effects of learner-to-learner interactions on social presence, achievement and satisfaction," *Journal of Computing in Higher Education,* vol. 30, no. 1, pp. 154-175, 2018.
[57] J. L. Shackelford and M. Maxwell, "Sense of community in graduate online education: Contribution of learner to learner interaction," *The International Review of Research in Open and Distributed Learning,* vol. 13, no. 4, pp. 228-249, 2012.
[58] T. Malinovski, M. Lazarova, and V. Trajkovik, "Learner− content interaction in distance learning models: students' experience while using learning management systems," *International Journal of Innovation in Education,* vol. 1, no. 4, pp. 362-376, 2012.
[59] C. n. L. Kee, "Face-to-Face Tutorial, Learning Management System and WhatsApp Group: How Digital Immigrants Interact and Engage in E-Learning?," *Malaysian Online Journal of Educational Technology,* vol. 8, no. 1, pp. 18-35, 2020.
[60] S. Erhel and E. Jamet, "Digital game-based learning: Impact of instructions and feedback on motivation and learning effectiveness," *Computers & education,* vol. 67, pp. 156-167, 2013.
[61] K. Frankola, "Why online learners drop out," *WORKFORCE-COSTA MESA-,* vol. 80, no. 10, pp. 52-61, 2001.
[62] R. Sims, G. Dobbs, and T. Hand, "Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation," *Distance education,* vol. 23, no. 2, pp. 135-148, 2002.
[63] T. D. Zimmerman, "Exploring learner to content interaction as a success factor in online courses," *The International Review of Research in Open and Distributed Learning,* vol. 13, no. 4, pp. 152-165, 2012.
[64] M. Ally, "Foundations of educational theory for online learning," *Theory and practice of online learning,* vol. 2, pp. 15-44, 2004.
[65] A. Hirumi, "A framework for analyzing, designing, and sequencing planned elearning interactions," *Quarterly Review of Distance Education,* vol. 3, no. 2, pp. 141-60, 2002.
[66] L. C. Tung, "Online Learner Interaction: Comparative study on structured and less structured course content in Learning Management System," *Published and Printed in Malaysia by,* p. 257, 2012.
[67] P. H. Wu, G. J. Hwang, M. Milrad, H. R. Ke, and Y. M. Huang, "An innovative concept map approach for improving students' learning performance with an instant feedback mechanism," *British Journal of Educational Technology,* vol. 43, no. 2, pp. 217-232, 2012.

[68] E. H. Mory, "Feedback research revisited," *Handbook of research on educational communications and technology,* vol. 2, pp. 745-783, 2004.
[69] A. Bischoff, "The elements of effective online teaching: Overcoming the barriers to success," *The online teaching guide: A handbook of attitudes, strategies, and techniques for the virtual classroom,* pp. 57-72, 2000.
[70] K. W. White and B. H. Weight, *The online teaching guide: A handbook of attitudes, strategies, and techniques for the virtual classroom*. ERIC, 2000.
[71] A. Webb and M. Moallem, "Feedback and Feed-Forward for Promoting Problem-Based Learning in Online Learning Environments," *Malaysian Journal of Learning and Instruction,* vol. 13, no. 2, pp. 1-41, 2016.
[72] A. Espasa and J. Meneses, "Analysing feedback processes in an online teaching and learning environment: an exploratory study," *Higher education,* vol. 59, no. 3, pp. 277-292, 2010.
[73] M. Mahle, "EFFECTS OF INTERACTIVITY ON STUDENT ACHIEVEMENT AND MOTIVATION IN DISTANCE EDUCATION," *Quarterly Review of Distance Education,* vol. 12, no. 3, 2011.
[74] T. Anderson, *The theory and practice of online learning*. Athabasca University Press, 2008.
[75] Y. J. Joo, K. Y. Lim, and E. K. Kim, "Online university students' satisfaction and persistence: Examining perceived level of presence, usefulness and ease of use as predictors in a structural model," *Computers & education,* vol. 57, no. 2, pp. 1654-1664, 2011.
[76] S. A. Gauci, A. M. Dantas, D. A. Williams, and R. E. Kemm, "Promoting student-centered active learning in lectures with a personal response system," *Advances in physiology education,* vol. 33, no. 1, pp. 60-71, 2009.
[77] C. K. Grund and M. Tulis, "Facilitating student autonomy in large-scale lectures with audience response systems," *Educational Technology Research and Development,* pp. 1-19, 2019.
[78] S. O. King and C. L. Robinson, "'Pretty Lights' and Maths! Increasing student engagement and enhancing learning through the use of electronic voting systems," *Computers & Education,* vol. 53, no. 1, pp. 189-199, 2009.
[79] B. Florenthal, "Students' motivation to participate via mobile technology in the classroom: a uses and gratifications approach," *Journal of Marketing Education,* vol. 41, no. 3, pp. 234-253, 2019.
[80] F.-F. Cheng, C.-C. Chiu, C.-S. Wu, and D.-C. Tsaih, "The influence of learning style on satisfaction and learning effectiveness in the asynchronous web-based learning system," *Library Hi Tech,* 2017.
[81] I. L. Harrell and B. L. Bower, "Student characteristics that predict persistence in community college online courses," *American Journal of Distance Education,* vol. 25, no. 3, pp. 178-191, 2011.
[82] D. M. Mupinga, R. T. Nora, and D. C. Yaw, "The learning styles, expectations, and needs of online students," *College teaching,* vol. 54, no. 1, pp. 185-189, 2006.
[83] A. Zapalska and D. Brozik, "Learning styles and online education," *Campus-Wide Information Systems,* 2006.
[84] P. Goodyear, G. Salmon, J. M. Spector, C. Steeples, and S. Tickner, "Competences for online teaching: A special report," *Educational Technology Research and Development,* pp. 65-72, 2001.

[85] P. E. Williams, "Roles and competencies for distance education programs in higher education institutions," *The American Journal of Distance Education,* vol. 17, no. 1, pp. 45-57, 2003.
[86] S. R. Aragon and S. D. Johnson, "Emerging roles and competencies for training in e-learning environments," *Advances in developing human resources,* vol. 4, no. 4, pp. 424-439, 2002.
[87] K. Selvi, "Teachers' competencies," *Cultura International Journal of Philosophy of Culture and Axiology,* vol. 7, no. 1, pp. 167-175, 2010.
[88] J. Bawane and J. M. Spector, "Prioritization of online instructor roles: implications for competency□based teacher education programs," *Distance education,* vol. 30, no. 3, pp. 383-397, 2009.
[89] T. M. Egan and M. Akdere, "Clarifying distance education roles and competencies: Exploring similarities and differences between professional and student-practitioner perspectives," *The American journal of distance education,* vol. 19, no. 2, pp. 87-103, 2005.
[90] T. Guasch, I. Alvarez, and A. Espasa, "University teacher competencies in a virtual teaching/learning environment: Analysis of a teacher training experience," *Teaching and Teacher Education,* vol. 26, no. 2, pp. 199-206, 2010.
[91] R. Hampel, "Training teachers for the multimedia age: Developing teacher expertise to enhance online learner interaction and collaboration," *International Journal of Innovation in Language Learning and Teaching,* vol. 3, no. 1, pp. 35-50, 2009.
[92] J. M. Schmeeckle, "Online training: An evaluation of the effectiveness and efficiency of training law enforcement personnel over the internet," *Journal of Science Education and Technology,* vol. 12, no. 3, pp. 205-260, 2003.
[93] A. El-Sayed, F. Mustafa, and A. Al-Mutawa, "Procrastination in online learner-led courses," in *Proceedings of the Second Kuwait Conference on e-Services and e-Systems*, 2011, pp. 1-5.
[94] P. Sorenson and L. Macfadyen, "Learner Interaction Monitoring System (LiMS): Capturing the Behaviors of Online Learners and Evaluating Online Training Courses," in *DMIN*, 2010, pp. 106-111.
[95] A. Puspitasari, J. W. Kanter, J. Murphy, A. Crowe, and K. Koerner, "Developing an online, modular, active learning training program for behavioral activation," *Psychotherapy,* vol. 50, no. 2, p. 256, 2013.
[96] B. Means, Y. Toyama, R. Murphy, and M. Baki, "The effectiveness of online and blended learning: A meta-analysis of the empirical literature," *Teachers College Record,* vol. 115, no. 3, pp. 1-47, 2013.
[97] G. Packham, P. Jones, C. Miller, and B. Thomas, "E□learning and retention: Key factors influencing student withdrawal," *Education+ Training,* 2004.
[98] A. P. Rovai, "Building classroom community at a distance: A case study," *Educational technology research and development,* vol. 49, no. 4, p. 33, 2001.
[99] J.-H. Park, "Factors Related to Learner Dropout in Online Learning," *Online Submission,* 2007.
[100] K. D. Stiller and R. Bachmaier, "Dropout in an online training for trainee teachers," *European Journal of Open, Distance and e-Learning,* vol. 20, no. 1, pp. 80-95, 2017.

[101] S. Bausch, A. Michel, and K. Sonntag, "How gender influences the effect of age on self□ efficacy and training success," *International Journal of Training and Development,* vol. 18, no. 3, pp. 171-187, 2014.
[102] S. J. Yoo and W. D. Huang, "Engaging online adult learners in higher education: Motivational factors impacted by gender, age, and prior experiences," *The Journal of Continuing Higher Education,* vol. 61, no. 3, pp. 151-164, 2013.
[103] F. Ke and D. Kwak, "Online learning across ethnicity and age: A study on learning interaction participation, perception, and learning satisfaction," *Computers & education,* vol. 61, pp. 43-51, 2013.
[104] M. Wang, C. Sierra, and T. Folger, "Building a dynamic online learning community among adult learners," *Educational Media International,* vol. 40, no. 1-2, pp. 49-62, 2003.
[105] M. Barak, A. Watted, and H. Haick, "Motivation to learn in massive open online courses: Examining aspects of language and social engagement," *Computers & Education,* vol. 94, pp. 49-60, 2016.
[106] A. C. Hlas, K. L. Schuh, and S. M. Alessi, "Native and non-native speakers in online and face-to-face discussions: Leveling the playing field," *Journal of Educational Technology Systems,* vol. 36, no. 4, pp. 337-373, 2008.
[107] Y. Zhang, "Power distance in online learning: Experience of Chinese learners in US higher education," *The International Review of Research in Open and Distributed Learning,* vol. 14, no. 4, 2013.
[108] K. Rao, "Universal design for online courses: Addressing the needs of non-traditional learners," in *2012 IEEE International Conference on Technology Enhanced Education (ICTEE)*, 2012, pp. 1-8: IEEE.
[109] L.-Y. Chung, "Exploring the effectiveness of self-regulated learning in massive open online courses on non-native English speakers," *International Journal of Distance Education Technologies (IJDET),* vol. 13, no. 3, pp. 61-73, 2015.
[110] L. S. de Montes, S. M. Oran, and E. M. Willis, "Power, language, and identity: Voices from an online course," *Computers and composition,* vol. 19, no. 3, pp. 251-271, 2002.
[111] M. Wang, "Designing online courses that effectively engage learners from diverse cultural backgrounds," *British Journal of Educational Technology,* vol. 38, no. 2, pp. 294-311, 2007.
[112] J. Hannon and B. D'Netto, "Cultural diversity online: student engagement with learning technologies," *International journal of educational management,* 2007.
[113] M. A. Tapanes, G. G. Smith, and J. A. White, "Cultural diversity in online learning: A study of the perceived effects of dissonance in levels of individualism/collectivism and tolerance of ambiguity," *The Internet and Higher Education,* vol. 12, no. 1, pp. 26-34, 2009.
[114] K. Shattuck, "Glimpses of the global coral gardens: Insights of international adult learners on the interactions of cultures in online distance education," 2005.
[115] C. McLoughlin, "Inclusivity and alignment: Principles of pedagogy, task and assessment design for effective cross□cultural online learning," *Distance Education,* vol. 22, no. 1, pp. 7-29, 2001.
[116] K. S. L. Grant and V. J. Lee, "Wrestling with issues of diversity in online courses," *Qualitative Report,* vol. 19, p. 12, 2014.

[117] C.-M. Wang and T. C. Reeves, "The Meaning of Culture in Online Education: Implications for Teaching, Learning and Desgin," in *Globalized e-learning cultural challenges*: IGI Global, 2007, pp. 1-17.
[118] I. Luyt, "Bridging spaces: Cross-cultural perspectives on promoting positive online learning experiences," *Journal of Educational Technology Systems,* vol. 42, no. 1, pp. 3-20, 2013.
[119] X. Liu, S. Liu, S. Lee, and R. J. Magjuka, "Cultural differences in online learning: International student perceptions," *Educational Technology & Society,* vol. 13, no. 3, pp. 177-188, 2010.
[120] L. Thompson* and H. Y. Ku, "Chinese graduate students' experiences and attitudes toward online learning," *Educational media international,* vol. 42, no. 1, pp. 33-47, 2005.
[121] C. N. Gunawardena, P. L. Wilson, and A. C. Nolla, "Culture and online education," *Handbook of distance education,* pp. 753-775, 2003.
[122] D. Yang, L. Olesova, and J. C. Richardson, "Impact of cultural differences on students' participation, communication, and learning in an online environment," *Journal of Educational Computing Research,* vol. 43, no. 2, pp. 165-182, 2010.
[123] M. S. Eastin and R. LaRose, "Internet self-efficacy and the psychology of the digital divide," *Journal of computer-mediated communication,* vol. 6, no. 1, p. JCMC611, 2000.
[124] G. D. Wagner and D. D. Flannery, "A quantitative study of factors affecting learner acceptance of a computer□based training support tool," *Journal of European Industrial Training,* 2004.
[125] R. M. Fuller, C. Vician, and S. A. Brown, "E-learning and individual characteristics: The role of computer anxiety and communication apprehension," *Journal of Computer Information Systems,* vol. 46, no. 4, pp. 103-115, 2006.
[126] L. Y. Muilenburg and Z. L. Berge, "Student barriers to online learning: A factor analytic study," *Distance education,* vol. 26, no. 1, pp. 29-48, 2005.
[127] C. Hart, "Factors associated with student persistence in an online program of study: A review of the literature," *Journal of Interactive Online Learning,* vol. 11, no. 1, 2012.
[128] N. Shin and J. K. Chan, "Direct and indirect effects of online learning on distance education," *British Journal of Educational Technology,* vol. 35, no. 3, pp. 275-288, 2004.
[129] K. Alvarez, E. Salas, and C. M. Garofano, "An integrated model of training evaluation and effectiveness," *Human resource development Review,* vol. 3, no. 4, pp. 385-416, 2004.
[130] L. Long, C. Dubois, and R. Faley, "A case study analysis of factors that influence attrition rates in voluntary online training programs," *International Journal on E-Learning,* vol. 8, no. 3, pp. 347-359, 2009.
[131] S. Y. Chyung, "Systematic and systemic approaches to reducing attrition rates in online higher education," *American Journal of Distance Education,* vol. 15, no. 3, pp. 36-49, 2001.
[132] E. I. Yukselturk, Fethi, "Examining the Factors Affecting Student Dropout in an Online Learning Environment," *ERIC Institute of Education Sciences,* 2006.
[133] P. Willging and S. Johnson, "Factors that influence students' decision to dropout of online," 2004.
[134] P. C. Sun, Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D., "What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction," *Computers & education,* vol. 50, no. 4, pp. 1183-1202, 2008.
[135] M. G. Moore, "Three types of interaction," ed: Taylor & Francis, 1989.

[136] J. J. Van Merrienboer and J. Sweller, "Cognitive load theory and complex learning: Recent developments and future directions," *Educational psychology review,* vol. 17, no. 2, pp. 147-177, 2005.
[137] T.-C. Chien, "Factors Influencing Computer Anxiety and Its Impact on E-Learning Effectiveness: A Review of Literature," *Online Submission,* 2008.
[138] K.-J. Kim and T. W. Frick, "Changes in student motivation during online learning," *Journal of Educational Computing Research,* vol. 44, no. 1, pp. 1-23, 2011.
[139] M. R. Lepper and R. W. Chabay, "Intrinsic motivation and instruction: Conflicting views on the role of motivational processes in computer-based education," *Educational Psychologist,* vol. 20, no. 4, pp. 217-230, 1985.
[140] S. Stöckli, Schulte-Mecklenbeck, M., Borer, S., & Samson, A. C., "Facial expression analysis with AFFDEX and FACET: A validation study," *Behavior research methods,* vol. 50, no. 4, pp. 1446-1460, 2018.
[141] T. L. Saaty, *Decision making with dependence and feedback: The analytic network process*. RWS Publ., 1996.
[142] H. R. Yazgan, S. Boran, and K. Goztepe, "An ERP software selection process with using artificial neural network based on analytic network process approach," *Expert systems with applications,* vol. 36, no. 5, pp. 9214-9222, 2009.
[143] G. M. Duman, A. El-Sayed, E. Kongar, and S. M. Gupta, "An intelligent multiattribute group decision-making approach with preference elicitation for performance evaluation," *IEEE Transactions on Engineering Management,* 2019.
[144] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *psychometrika,* vol. 16, no. 3, pp. 297-334, 1951.
[145] M. Tavakol and R. Dennick, "Making sense of Cronbach's alpha," *International journal of medical education,* vol. 2, p. 53, 2011.
[146] i. B. R. Platform, "Facial Expression Analysis: The Complete Pocket Guide," 2017.
[147] W. Mischel, *The marshmallow test: Understanding self-control and how to master it*. Random House, 2014.

APPENDIX 1: Research and Ethical Compliance

This research meets the ethical, federal and legal standards established for human subjects and governed by the University of Bridgeport Institutional Review Board (UB IRB). The following exemption determination is an official confirmation that UB determined that this research with its questionnaire applied to specific participants does meet these ethical, federal and legal standards.

EXEMPTION DETERMINATION
July 1, 2020

Serap Zel, Ph.D. (Candidate)
College of Engineering, Business and Education
University of Bridgeport

Dear Ms. Serap Zel,

On July 1st 2020, the designated IRB reviewer approved the following human subjects research:

Type of Review: Expedited Review

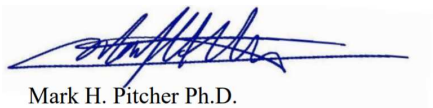
Project Title: Increasing the effectiveness and inclusivity of online learning using facial expressions analysis
Investigator: Serap Zel, Ph.D. (Candidate)
IRB ID: 2020 05 22

To request continuing approval, you are to submit a completed "UB HRP-212 FORM: Continuing Review Progress Report" and required attachments by June 1st 2021. For study closure, you are to submit a completed "UB HRP-212 FORM: Continuing Review Progress Report" and required attachments by August 1st 2021.

If continuing review approval is not granted before the expiration date of July 1st 2021, this research expires on that date.

In conducting this research, you are required to follow the requirements listed in the Investigator Manual.

Sincerely,



Mark H. Pitcher Ph.D.
Director, Health Sciences Inter-professional Research
IRB Administrator

APPENDIX 2: Pre-training Questionnaire

1. What is your age group?
   - € 21-30
   - € 31-40
   - € 41-50
   - € 51-60
   - € 60+

2. Currently, which region are you based in?
   - € North America
   - € Latin America
   - € Europe
   - € Middle East
   - € Africa
   - € Asia
   - € Other (Please Specify)

3. What is your gender?
   - € Female
   - € Male
   - € Other
   - € Prefer not to say

4. How do you describe your cultural origin?
   - € Hispanic/Latino
   - € African American
   - € Asian American
   - € White
   - € European
   - € Middle Easterner
   - € Asian
   - € Mixed
   - € Other (Please Specify)

5. What is your native or preferred language?
   - € English
   - € Spanish

- € Russian
- € French
- € Chinese
- € Hindi
- € Urdu
- € Arabic
- € Turkish
- € Other (Please Specify)

6. What is your highest education level?
- € High school
- € Bachelor
- € Master/MBA
- € PhD
- € Other (Please Specify)

7. Which of the following best describes your current employment status?

- € Working (full or part time)
- € Self-employed
- € Student
- € Retired
- € Not working
- € Other (Please Specify)

8. In online live training, how would you rate the impact of "Trainer-Participant Interaction" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participants					
Trainer's expertise and competencies					
Training's ability to accommodate different learning styles (visual, verbal etc.)					

Participant's native or preferred language					
Participant's motivation level on the training topic					
Participant's technology comfort level					

9. In online live training, how would you rate the impact of "Interaction among participants" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Participant's gender					
Participant's cultural identity					
Participant's physical environment (noise, light etc.)					
Participant's external environment (family, work etc.)					

10. In online live training, how would you rate the impact of "Participant-Content Interaction" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Value-added feedback between the trainer and participants					
Participant's native or preferred language					
Participant's motivation level on the training topic					

Participant's technology comfort level					
Participant's cultural identity					

11. In online live training, how would you rate the impact of "Value-added feedback between the trainer and participant" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
The simplicity of the technology platform					
Training's ability to accommodate different learning styles (visual, verbal etc.)					
Trainer's expertise and competencies					
Length, duration, and frequency of the training					
Participant's motivation level on the training topic					
Participant's technology comfort level					

12. In online live training, how would you rate the impact of "The simplicity of the technology platform" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					

Training's ability to accommodate different learning styles (visual, verbal etc.)					
Length, duration, and frequency of the training					
Participant's native or preferred language					
Participant's motivation level on the training topic					
Participant's technology comfort level					

13. In online live training, how would you rate the impact of "Training's ability to accommodate different learning styles (visual, verbal etc.)" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
The simplicity of the technology platform					
Length, duration, and frequency of the training					
Participant's motivation level on the training topic					
Participant's technology comfort level					

14. In online live training, how would you rate the impact of "Trainer's expertise and competency" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Training's ability to accommodate different learning styles (visual, verbal etc.)					
Length, duration, and frequency of the training					
Participant's motivation level on the training topic					
Participant's technology comfort level					

15. In online live training, how would you rate the impact of "Length, duration and frequency of the training" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Training's ability to accommodate different learning styles (visual, verbal etc.)					
Participant's motivation level on the training topic					

Participant's external environment (family, work etc.)					

16. What is your interest level in this online training topic?

(Training topic: The impact of technology on emotional intelligence)

1	2	3	4	5	6	7	8	9	10
Not interested at all									Extremely Interested

APPENDIX 3: Post-training Questionnaire

1. In online live training, how would you rate the impact of "Participant's age" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
The simplicity of the technology platform					
Participant's motivation level on the training topic					
Participant's external environment (family, work etc.)					
Participant's physical environment (noise, light etc.)					

2. In online live training, how would you rate the impact of "Participant's gender" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					

Participant-content interaction					
Training's ability to accommodate different learning styles (visual, verbal etc.)					
The simplicity of the technology platform					
Participant's motivation level on the training topic					
Participant's physical environment (light, noise etc.)					
Participant's external environment (family, work etc.)					

3. In online live training, how would you rate the impact of "Participant's native or preferred language" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Training's ability to accommodate different learning styles (verbal, visual etc.)					
Participant's cultural identity					
Participant's psychical environment (noise, light etc.)					

4. In online live training, how would you rate the impact of "Participant's cultural identity" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Training's ability to accommodate different learning styles (visual, verbal etc.)					
Participant's native or preferred language					
Participant's motivation level on the training topic					

5. In online live training, how would you rate the impact of "Participant's motivation level on the training topic" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Participant's age					
Participant's gender					
Participant's cultural identity					
Participant's external environment (family, work etc.)					

6. In online live training, how would you rate the impact of "Participant's external environment (family, work etc.)" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Participant's gender					
Participant's motivation level on the training topic					
Participant's physical environment (noise, light etc.)					

7. In online live training, how would you rate the impact of "Participant's physical environment (noise, light etc.)" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant
Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
Participant's motivation level on the training topic					
Participant's technology comfort level					

8. In online live training, how would you rate the impact of "Participant's technology comfort level" on each following criteria?

Criteria	Very Insignificant	Insignificant	Neutral	Significant	Very Significant

Trainer-participant interaction					
Interaction among participants					
Participant-content interaction					
Value-added feedback between the trainer and participant					
The simplicity of the technology platform					
Participant's age					
Participant's gender					
Participant's native or preferred language					
Participant's motivation level on the training topic					
Participant's external environment (family, work etc.)					

9. In the online training you participated, how would you rate the simplicity of the technology platform that was used in the training?

1	2	3	4	5	6	7	8	9	10

Extremely Complex Extremely Simple

10. How comfortable did you feel to have your camera on during the training?

1	2	3	4	5	6	7	8	9	10

Extremely Uncomfortable Extremely Comfortable

11. What was the impact of being able to see the faces of participants on your interaction with other participants?

1	2	3	4	5	6	7	8	9	10

Extremely negative impact Extremely positive impact

12. What was the impact of being able to see the faces of participants on your interaction with the trainer?

1	2	3	4	5	6	7	8	9	10

Extremely negative impact Extremely positive impact

13. Would you prefer "live" or "pre-recorded" online training for this type of training?

€ Live

- € Pre-recorded (offline)
- € Both are fine

14. What did you like MOST about this training? (only one thing, please)

15. What did you like LEAST about this training? (only one thing, please)

16. How would you rate your overall learning experience in this training?

1	2	3	4	5	6	7	8	9	10

Extremely Poor Extremely Good